

Universities Space Research Association
4950 Corporate Drive, Suite 100
Huntsville, AL 35806
(205) 895-0582

October 27, 1989

TRANSMITTAL LETTER

Please find enclosed copies of the Final Report fulfilling the reporting requirements for Contract NAS8-37583, "Space Station Attached Payload Program Support".

Respectfully submitted,



Maurice G. Estes, Jr.
Contracts Manager

(NASA-CR-183838) SPACE STATION ATTACHED
PAYLOAD PROGRAM SUPPORT Final Report, 4 Oct.
1988 - 30 Sep. 1989 (USRA) 11 p CSCL 22B

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UNIVERSITIES SPACE RESEARCH ASSOCIATION

Atmospheric Sciences / Microgravity Sciences / Astronomy

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October 27, 1989

Contract NAS8-37583

Final Report

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1	Contract Administrator USRA Headquarters The American City Building, Suite 212 Columbia, MD 21044
2	NASA Scientific & Technical Information Facility Attn: Accessioning Department P.O. Box 8757 Baltimore/Washington International Airport, MD 21240

Subject: Enclosed is the Final Report prepared under
Contract No. NAS8-37583.

SPACE STATION ATTACHED PAYLOAD PROGRAM SUPPORT

Final Report

Contract: NAS8-37583

Program Director: Floyd I. Roberson

Submitted to:

THE GEORGE C. MARSHALL SPACE FLIGHT CENTER

MARSHALL SPACE FLIGHT CENTER

ALABAMA 35812

By:

UNIVERSITIES SPACE RESEARCH ASSOCIATION

4950 CORPORATE DRIVE, SUITE 100

HUNTSVILLE, AL 35806

October 27, 1989

Task 1: Proposal Review

Universities Space Research Association (USRA) provided conference planning assistance for the Space Station Attached Payload Peer Review which was held at the Holiday Inn in Huntsville, Alabama. USRA determined the logistical requirements for the peer review meeting and made preparations accordingly. USRA negotiated with the Holiday Inn for facilities, made arrangements for meals, provided computers, printers, copiers and other equipment needed for the peer review, contracted with and scheduled temporary personnel for administrative assistance and negotiated a special airfare agreement with American Airlines.

Contractual agreements were prepared for each reviewer to ensure that honorariums and travel expense reimbursements were made in accordance with government regulations. USRA assisted the reviewers by providing general information on the Huntsville Area and responding to inquiries regarding travel, facilities, lodging, honorarium etc. The Program Director provided general management oversight for the effort. The results of the review were a strengths and weaknesses analysis and criteria report of each of the proposals. The strengths and weaknesses report was provided to the NASA program scientists and to the COTR. This report contains sensitive information and is not reproduced in this final report. A total of 87 reviewers evaluated 72 proposals during the peer review. A list of the reviewers is included in Appendix A.

Task 2: Experiment Requirements Data Base

USRA developed data base software for the peer review effort and provided for the management of data input and quality control. Programs were developed for the execution of data base output reports to support the technical assessment of proposals submitted in response to the Attached Payloads AO. Mr. Warren Moody was appointed as a consultant to assist with the development of data base software.

Task 3: Engineering and Technical Assessment Support

USRA negotiated subcontracts with Titan Systems Inc. and Payload Integrators Inc. to meet the requirements of this task. Titan Systems, which worked from November 21, 1988 to May 31, 1989, provided for: systems engineering support for technical assessment of proposals and compatibility analysis of experiments and experiment groups, structural, mechanical, and thermal systems engineering support for technical assessment of proposals and compatibility analysis of experiments and experiment groups, and support for engineering and management information systems. Titan System's final report is included in Appendix B.

Following the peer review process in February, Payload Integrators was retained by USRA to provide engineering management and planning support for the technical assessment of the proposals. Payload Integrators performed the following tasks: development and documentation of category 1 Flight and EOS proposal strengths and

weaknesses, development of mission sets for space station deployment in the 1994-1995 timeframe, engineering analysis supporting the selection of these mission sets and technical support and attendance at the NASA Selection Committee meeting and reviews. The final report submitted by Payload Integrators is in Appendix C.

Financial

USRA has completed the tasks required in the statement of work within negotiated budgetary limits:

Contract Value:	\$687,298
Authorized Funding:	\$450,000
Expenditures:	\$382,066
Balance:	\$67,934

The balance above covers the contract period through August 31, 1989. This balance substantially reflects the expenditures needed to complete the statement of work, however, the final balance is dependent on provisional rates being adjusted and other contract related costs being expensed.

Appendix A

Universities Space Research Association sponsored the Space Station Freedom Attached Payload Proposal Review Meeting, January 30 - February 3, 1989, at the Holiday Inn/Research Park. The following individuals were invited to serve as peer reviewers:

Dr. Michael A'Hearn	The University of Maryland
Dr. David Berley	The University of Maryland
Dr. Albert L. Betz	The University of California, Berkeley
Dr. Guenter E. Brueckner	Naval Research Laboratory
Dr. Bernard F. Burke	Massachusetts Institute of Technology
Dr. Charles W. Carlson	The University of California, Berkeley
Dr. Robert Carlson	Mitre Corporation
Dr. George Cassiday	The University of Utah
Dr. Richard C. Catura	Lockheed Palo Alto Research Laboratory
Dr. Tom Clark	Goddard Space Flight Center
Dr. Robert E. Collin	Case Western Reserve University
Dr. John D. Craven	The University of Iowa
Dr. Kyle Cudworth	The University of Chicago
Dr. Frederic Davidson	Johns Hopkins University
Dr. David Deamer	University of California, Davis
Dr. Stan Dermott	Cornell University
Dr. Julius Dohnanyi	Bellcore
Dr. Samuel Durrance	Johns Hopkins University
Dr. James A. Earl	The University of Maryland
Dr. Heinrich Eichhorn	The University of Florida
Dr. Bruce Fegley	Massachusetts Institute of Technology
Dr. Edward E. Fenimore	Los Alamos Scientific Laboratory
Dr. Wayne Fenner	The Aerospace Corporation
Dr. Ed Fitzpatrick	Princeton University Observatory
Professor Peter H. Fowler	The University of Bristol
Dr. Everett Gibson	Johnson Space Center
Dr. Paul F. Goldsmith	The University of Massachusetts
Dr. Philippe Goret	Service d'Astrophysique
Dr. Ted Gull	Goddard Space Flight Center
Professor Francis Halzen	The University of Wisconsin
Dr. J. Patrick Henry	The University of Hawaii
Dr. Peter R. Herczfeld	Drexel University
Dr. Robert A. Hoffman	Goddard Space Flight Center
Dr. David J. Hollenbach	Ames Research Center
Dr. Don Humes	Langley Research Center
Dr. William M. Isbell	General Research Corporation
Dr. John Kelly	SRI International
Dr. Bill Kinard	Langley Research Center
Professor Paul Kintner	Cornell University
Dr. Roger Knacke	The State University of New York, Stony Brook
Dr. H. Kuczera	Unternehmensbereich Raumfahrt
Dr. James D. Kurfess	Naval Research Laboratory
Dr. Barry Lasker	Space Telescope Science Institute

Professor John Learned

Dr. Marvin Leventhal
Dr. Alan P. Marscher
Dr. Christopher Martin
Professor Glenn M. Mason
Dr. Barry H. Mauk
Dr. Fulvio Melia
Dr. C. I. Meng
Dr. Peter Meszaros
Dr. Stanley Miller

Dr. David Monet
Dr. Thomas E. Moore
Dr. Joseph Nuth
Dr. Costas Papaliolios

Dr. Ronald Parise
Dr. Deane Peterson

Dr. Douglas Phinney

Dr. Timothy Pratt

Dr. John C. Raymond
Dr. Richard E. Rothschild

Dr. Gary Rottman
Dr. Edward J. Schmahl
Dr. Wolfgang K. H. Schmidt

Dr. Ethan J. Schreier

Dr. Bonny Schumaker
Dr. Tom Scott
Dr. Ken Seidelmann
Dr. Harlan Smith
Dr. Harold Sobol

Dr. Sabatino Sofia

Dr. Robert A. Stern

Dr. Peter Stockman

Dr. Andrew Szentgyorgyi
Dr. Jill Tarter
Dr. Bonnard J. Teegarden
Dr. John Tremor
Dr. Arthur Upgren
Dr. Gerard Van Hoven

Dr. C. Jake Waddington
Dr. William R. Webber
Dr. Alex B. Wenzell
Dr. Gart Westerhout
Dr. Robert W. Wilson
Dr. Arnold Wolfendale

The University of Hawaii at
Manoa

Bell Telephone Laboratories
Boston University
Columbia University
The University of Maryland
Johns Hopkins University
Northwestern University
Johns Hopkins University
Pennsylvania State University
University of California,
San Diego

Marshall Space Flight Center
Goddard Space Flight Center
Harvard/Smithsonian Center for
Astrophysics

Goddard Space Flight Center
The State University of New
York, Stony Brook

Lawrence Livermore National
Laboratory

Virginia Polytechnic Institute
and State University

Center for Astrophysics
The University of California,
San Diego

The University of Colorado
The University of Maryland
Max Planck Institut fur
Aeronomie

Space Telescope Science
Institute

Jet Propulsion Laboratory
University of North Carolina
U.S. Naval Observatory
The University of Texas
The University of Texas at
Arlington

Center for Solar and Space
Research

Lockheed Palo Alto Research
Laboratory

Space Telescope Science
Institute

Columbia University
Ames Research Center
Goddard Space Flight Center
Ames Research Center
Wesleyan University
The University of California,
Irvine

The University of Minnesota
The University of New Hampshire
Southwest Research Institute
U.S. Naval Observatory
AT&T Bell Laboratories
The University of Durham

APPENDIX B

TITAN SYSTEMS FINAL REPORT

Date: 9 June 1989

Reporting Period: 1 April 1989 - 30 April 1989

Contract Title: Engineering Support of Space Station Attached Payload Proposal Evaluation

Contract Number: NAS8-37583

Period of Performance: 21 November 1988 - 31 May 1989

Amount Expended Through 31 March 1989: \$90,075

Major Accomplishments During Reporting Period:

TITAN Systems provided support from November 21, 1988 through May 31, 1989 to NASA in proposal technical evaluation, review and grouping of attached payloads being considered for flight on Space Station Freedom.

A total of 95 payload proposals were initially evaluated and grouped into the following categories:

CATEGORIES	NUMBER OF PROPOSALS
• Flight Proposals	39
• Concept Proposals	32
• Earth Observation	<u>24</u>
	95

Individual technical evaluation forms were completed on each of the 95 proposals, covering 18 discipline areas, i.e., weight, power, thermal telemetry, etc. Integrated matrices were developed reflecting different combinations of these disciplines which were used as a basis for making a comparative assessment of the payloads. Support was also provided in the management assessment in the areas of experiment complexity and estimated comparative cost based on similar instruments. Results of this assessment were used by NASA/MSFC to develop reports to NASA Headquarters which we reviewed for technical adequacy and completeness prior to release.

The first phase of the review culminated in a technical interchange meeting sponsored by NASA Headquarters and held January 30 - February 1, 1989, at the Holiday Inn Research Park, Huntsville, Alabama.

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As a result of this meeting, a number of technical engineering questions and actions were generated by NASA Headquarters. Addressing these questions required revisiting all 95 payload proposals, and the development of data covering the following disciplines:

- Special/Deployable Hardware
- Pointing Stability
- Mass/Volume
- Field of Vision/Orientation
- Coarse/Fine Pointing Designation
- Fluid/Venting

Subsequently, as a result of technical and science evaluations, the number of payload proposals under consideration was reduced by NASA Headquarters from 95 to 40 as follows:

• Flight	39 to 21
• Concept	32 to 10
• EOS	<u>24</u> to <u>9</u>
	95 40

After this reduction, NASA Headquarters requested the following actions which were worked:

- Develop strengths and weaknesses for each flight proposal.
- List major integration concerns and impact on Space Station for each Concept proposal.
- Develop initial options for the grouping of payloads from the Flight and Earth Observation Science (EOS) proposals.

In the final payload assessment period, the 10 Concept proposals were dropped from further consideration. Our effort was then concentrated on a greater in-depth assessment for the remaining 30 payloads. Development of payload options into integrated groupings were made. These groupings could be carried in the Shuttle for mounting on Space Station attach locations and facilities.


Approximately, 30 combinations were developed, mounting and support equipment defined, and cost and weight data prepared. Several iterations were performed based on various change inputs provided by NASA Headquarters and MSFC. Results were used by MSFC personnel for presentation and review with NASA Headquarters.

We also provided support throughout the period in working action items for NASA Headquarters and MSFC personnel. These dealt primarily with special assessments of the proposals to extract experiment technical information and to answer detailed accommodation and integration questions. At no time were we unable to provide the support requested in a timely and responsive manner.

During the latter part of the task period we supported the additional refinement of selected payload combinations to optimize the use of resources and to maximize the number of payloads that could be accommodated. Support was also provided to MSFC in follow-on meetings with NASA Headquarters as final payload selections and accommodation decisions were being made.

All of the task objectives defined in the Statement of Work were met. All task assignments were completed and the effort was brought to an orderly and satisfactory conclusion. Technical contributions were made in all disciplines as needed to insure a good evaluation and the development of optimum payload groupings. No serious problems were encountered in working the task and progress was always on or ahead of schedule.

APPENDIX C

 Payload Integrators, Inc

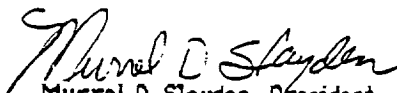
Payload Integrators, Incorporated, final report for contract NAS-8-37583.

The purpose of this contract was to provide an engineering assessment of the suitability of ninety five experiment proposals for Space Station application. Technical, managerial, and cost data were generated for each experiment, evaluated against published Space Station accommodations technical criteria and operational guidelines, and the relative merits of each proposal documented. "Mission sets", chosen from the general population of experiments, were developed to analytically determine compatible groupings and subsequent increment operational sets to be concurrently operated on the Space Station. The outputs of these tasks were used in conjunction with the Science Committee evaluations to aide the NASA Headquarters Selection Committee in selecting the initial complement of attached payloads to be flown on the Space Station. All contract requirement were fulfilled in a timely and judicious manner.

The initial evaluation consisted of (1) determining experiment key operational parameters and comparing these data against Space Station accommodations, (2) evaluating the proposed management plan against acceptable NASA standards, and (3) developing a cost model to determine probable cost versus proposer stated expenditures. This data was documented and provided as a series of reports to NASA Headquarters personnel. The data of item (1) was provided the Science Committee for their final meeting held at the Holiday Inn, January 30 thru February 1, at Huntsville, Alabama. Selected members of the technical committee provided support and gave numerous presentations at this meeting.

Subsequent to the above meeting, the NASA Headquarters Selection Committee judged forty five of the proposals as unacceptable due to non-compliance to the Announcement of Opportunity (AO) criteria. Of the remaining forty proposals, thirty were accepted as "Flight Proposals" (concept mature enough for hardware development), and ten proposals classified as "Concepts" (need additional development work prior to design execution). The Technical Committee then developed numerous "mission sets" from the general population of the thirty "Flight Proposals" for NASA Headquarters consideration. This activity culminated in the documentation of fifteen payload increments being presented to the Selection Committee in Washington, D. C., on 4/14/89.

Throughout the contract period numerous analysis and consultation was provided the Selection Committee. The preliminary design of two launch carriers to facilitate transporting unique experiments to orbit was performed and documented. There were several iterations of cost data for numerous experiments and action items to clarify related secondary points in the deliberation process. The final NASA AO Selection Committee meeting on May 16 thru May 19, 1989 in Washington, D. C. was attended and the final technical inputs were presented. The remainder of the contract period was expended in documenting action items as a result of this meeting.


Murrel D. Slayden, President
Payload Integrators, Inc.

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Report Documentation Page

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16. Abstract USRA is providing management and technical support for the peer review of the Space Station Freedom Attached Payload proposals. USRA is arranging for consultants to evaluate proposals, arranging meeting facilities for the reviewers to meet in Huntsville, Alabama and management of the actual review meetings. Assistance in developing an Experiment Requirements Data Base and Engineering/Technical Assessment support for the MSFC Technical Evaluation Team is also being provided. The results of the project will be coordinated into a consistent set of reviews and reports by USRA. The strengths and weaknesses analysis provided by the peer panel reviewers will be used by NASA personnel in the selection of experiments for implementation on the Space Station Freedom.			
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